comparator comparing to fixed/re-configurable thresholds. In some embodiments, this block will also include ADC (analog to digital converter), FSM (finite state machine) etc.

[0047] The power recovery circuit can also be adaptively reconfigurable responsive to changes in the one or more system parameters. FIG. **2** shows an example of this configuration. Different implementations of the power recovery circuits include only rectifier, rectifier with addition of charge pump for different voltage/current ratio, rectifier with voltage regulator for getting a regulated voltage, and so on. Power recovery circuit can also include one or more storage elements or no storage element. In addition, more electronics can be included in the power recovery circuit in order to adjust the effective impedance to further improve the matching efficiency and thus overall efficiency.

[0048] Other reconfigurable parameters of the system include but are not limited to input power to the Tx, Tx beam forming pattern, matching network topology and components, voltage and current transformation ratios in the power recovery circuit, internal clock frequencies, and voltage and current supplies.

[0049] The reconfigurable parameters are usually frequency dependent; therefore, one can optimize system efficiency by choosing an optimal frequency for different operating conditions. Most wireless power transfer links operate at the resonance frequency of the Tx and Rx devices; however, with adaptive matching and system reconfiguration this is not necessary and will often result in non-optimal efficiency, especially in the presence of link aberrations. For example, both the impedance of Tx and Rx can be changed with frequency. Similarly, efficiency and effective aperture of Rx can also be controlled by frequency. As shown in FIGS. **3**A-B, the power conversion efficiency (η_{rec}) and the impedance of an example ultrasonic transducer used in ultrasonically powered implants is a function of frequency. η_{match} can be optimized by operating at optimal frequency for different power consumed by electrical loads.

[0050] Since the effective impedance of reconfigurable matching network along with the power recovery circuit is dependent on frequency, power level, and also on the input voltage or current, if changes in the system parameters are performed, the reconfigurable matching network should be adjusted in order to maximize the power delivered to the load by efficiently interfacing the power receiver to the power recovery circuit. The matching network can be reconfigured using several switches and passive and/or active components (inductors, capacitors, transmission lines, baluns or transformers, switched capacitor circuits or programmable on-chip capacitor array) for enabling a power match to the receiver. Examples of reconfigurable matching networks for ultrasonically powered medical implants are shown on FIG. **4**. Here, the capacitance is adaptively changed based on different electrical load power.

[0051] In certain scenarios, the system controller adjusts the system parameters including the power transfer frequency through a real-time closed-loop control. In certain other cases, where the changes in the load or the system parameters are predictable (e.g., during an initialization prior to beginning closed loop control), the system controller changes the system parameters, including the power transfer frequency, in a pre-determined order. Here the system variables driving the control are predetermined (e.g., a programmed initialization sequence).

[0052] FIG. **5** shows an exemplary embodiment where the acoustic transmitter **506** is configured to be wearable while it is acoustically powering implanted receiver units **508** and/or **510**. Here receiver units **508** and **510** are implanted in the body **502** of a user. Preferably, acoustic transmitter **506** is configured to be in communication with a mobile device **504**. This can provide a convenient way for the user to be informed of system operation, status reports, diagnostic results, etc.

[0053] For an ultrasound powered implantable system, the external ultrasound power transmitting and data receiving unit can be a wearable and/or flexible device contacted to the skin; one example is a band aid device. The external unit itself can be connected to a base station, which can be a mobile device (e.g. phone), through RF wireless technology or using wire. Closed loop processing can take place between implant, wearable ultrasonic powering unit, or base station, or any combination of these.

[0054] Systems according to the above-described principles can include multiple transmitters, multiple receiver units, and/or multiple transducers on a receiver unit, in any combination. FIG. **6** shows an example having transmitters **602**, **604**, and **606**, receiver units **610** and **620**, and system controller **630**. Receiver unit **610** includes transducer **612**, matching network **614**, power conversion circuit **616** and load **618**. Receiver unit **620** includes transducers **622**a, **622**b and **622**c, matching network **624**, power conversion circuit **626** and load **628**.

[0055] Receiver unit **620** can be regarded as including two auxiliary acoustic transducers (e.g., **622**b and **622**c) in addition to acoustic transducer **622**a. An output of acoustic transducer (**622**a) and outputs of the auxiliary acoustic transducers (**622**b and **622**c) can be combined and provided to the electrical load **620**. This combining can be done coherently or incoherently. In this case, the controlled system parameters can further include a combining configuration of the acoustic transducer and the one or more auxiliary acoustic transducers.

[0056] Other functions can also be provided with multi-Tx and/or multi-Rx configurations. The system controller can be configured to provide location tracking of the receiver unit combined with beam forming of the acoustic radiation according to the tracked location of the receiver unit. FIG. **7** shows an example of this, where a Tx array **702** provides beam forming that allows selection between multiple implants **704**, **706**, **708**, tracking motion of one or all of these implants, and/or simultaneous powering of the implants via transmission beam forming.

[0057] Adaptive beam-forming on the Tx can be used to individually address and power one or multiple receiver platforms. One method for adaptive beam-forming is to first image the surroundings using the Tx and determine the coordinates and orientation of each receiver platform. These coordinates and orientation information can be stored in the memory of either the Tx or the receiver platform or both. Further, this data can be matched against the unique address or code of each receiver platform and stored in the memory. This operation of imaging the surroundings and storing the relevant data can be performed periodically. Periodic updating is preferred due to reasons discussed above, including, but not limited to: changes in environmental conditions of the link, objects surrounding the link, misalignment and/or rotation of the receiver platform, changes in the properties of the electronic circuits, change in the electrical load, etc.